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somewhat costly undertaking; for many bridges were required, and it was no easy matter to make the path perfectly safe and convenient throughout the drop from the high plateau to the river.

On this path is Tarma, a prosperous little city of over 8,000 inhabitants, very healthful, with good schools and many resources. A journey of ten or twelve hours down the path takes the traveller into the fertile Chanchamayo valley, of which La Merced is the commercial centre. Here the forest region may be said to begin. The valley stands about 3,285 feet above sea-level, and has a healthful climate. La Merced, though small, is a flourishing town. Puerto Bermudez, where the bridle-path ends, is only 273 miles from the Pacific Ocean at Callao and 136 miles from the railroad terminus at Oroya. The difference of elevation between Puerto Bermudez and Oroya is 11,466 feet, and this part of the trans-continental route thus involves the hardest travel.

The journey from Puerto Bermudez to Iquitos by the Rivers Pichis, Pachitea, and Ucayali is about 1,000 miles, which is covered in six days by the steam launches of Peru on the down trip and in from ten to twelve days on the up journey. Iquitos is in regular connection by steamship with Europe. At several points along the land route the Peruvian Government has established inns, where the wayfarer may find fairly comfortable quarters and abundant food supplies. The inns are at intervals covered by the daily journeys.

The areas marked on the map as adapted for cultivation are regarded as offering particular attraction to immigration. The natural products of the region, such as rubber, gums, resins, timber, medicinal plants, and dyewoods, offer fine opportunities, besides the cultivated crops, such as cacao, coffee, sugar-cane, and other products suited to the climate.

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#### TOPOGRAPHIC SURVEYS IN WESTERN UNITED STATES.

In the last issue a brief résumé was given of the results of the topographic work of the Eastern Division of Topography of the U. S. Geological Survey during the season of 1904. The Western Division, which operates in the arid regions, being particularly those west of the great plains, also had an active season in 1904, and mapped a considerable area. A notable fact in connection

with the recent work of the topographic mapping in the Far West is the increased demand for more detailed maps and the increasingly larger areas being mapped on scales of 1 mile to 1 inch or larger. Until about ten years ago maps made on scales of 4 miles to 1 inch and with contours of interval of 200 feet seemed ample to meet all the requirements of the geologists and engineers. Then work on the more detailed scale of 2 miles to 1 inch, with contours of interval of 50 or 100 feet, came into demand. Practically all of the geological exploratory work for the United States has now been done. The locations of the larger areas of valuable economic minerals are known in a general way. The field examinations of the geologists are, therefore, becoming restricted to more detailed examinations of these fields, with a view to their thorough development. This calls for more detailed topographic base-maps. In like manner, the exploratory examinations of the engineers of the Reclamation Surveys are practically concluded, and the detailed studies of water resources and facilities for water storage and diversion must now be attempted. These problems likewise call for detailed topographic maps.

The result of the working of these various forces is seen in the large area mapped during the past season in Butte County, South Dakota, where about 250 square miles were surveyed on a scale of 1,000 feet to 1 inch, with a view to the completion of the study for the Belle Fourche irrigation project.

In Montana a large area in Choteau and Valley counties was surveyed with considerable detail, in order to furnish data for the Milk River reclamation project. This includes maps on the scale of 1 to 24,000, or 2,000 feet to 1 inch, in the neighbourhood of Hinsdale, Box Elder, and Lonesome, including Lonesome Lake reservoir and dam site; also a stretch of country about 200 miles in length between Hinsdale and Glasgow, Montana. These detailed maps are most interesting, and furnish an excellent study of the topographic forms in the northwestern portion of the United States. In the same general region in Montana surveys of a larger area on the smaller scale of 1 mile to the inch were made about Kremlin, Big Sandy, and Laredo. In Flathead County, Montana, 1,000 square miles were mapped in the neighbourhood of Kintla Lakes on the scale of 2 miles to 1 inch.

In Texas an area of 1,000 square miles was mapped in the neighbourhood of Van Horn, El Paso County, on a scale of 2 miles to 1 inch. In Colorado an area of equal size was mapped on the same scale in the neighbourhood of San Cristobal, in Hinsdale

and Mineral counties. All of the foregoing work was preceded by expansion of primary triangulation to furnish geodetic control, and careful spirit-levels were run everywhere to determine elevations above sea-level. In the neighbourhood of Black Hawk, in Jefferson, Boulder, and Gilpin counties, Colorado, an area of about 250 square miles was mapped on a scale of 1 mile to the inch. Detailed surveys on the large scale of 1,000 feet to 1 inch were made in the neighbourhoods of Idaho Springs, Silver Plume, and Central City, Colorado, in Clear Creek, Gilpin, and Teller counties.

In Washington about 1,000 square miles were mapped about Mt. Adams, in Yakima and Klickitat counties. This is a most interesting region, because Mt. Adams is one of the highest in the northwest. About 500 square miles, on the scale of 2 miles to 1 inch, were also mapped in Whitman County, Washington. In Utah the region about Gilbert Peak, in Summit and Wasatch counties, was mapped on a scale of 2 miles to 1 inch. There was also done a considerable amount of levelling and triangulation and some preliminary mapping in the neighbourhood of Frisco, Utah, in Beaver and Millard counties, on a scale of 1 mile to 1 inch. In the neighbourhood of Telocaset, Oregon, an area of 1,000 square miles was mapped on a scale of 2 miles to 1 inch in Union and Wallowa counties. Also, in the neighbourhood of Grant's Pass a smaller area was partially mapped on the same scale in portions of Jackson and Josephine counties.

In California a large amount of work was done, including maps on the scale of 1 mile to 1 inch, in the neighbourhood of Bakersfield, in Kern county, and of Pleasanton, in Alameda and Contra Costa counties. On the more detailed scale of 2,000 feet to the inch an area about Iron Mountain, in Shasta county, was mapped. In Kern county, with a view to more careful study of great oil development, three areas were mapped on the large scale of 1,000 feet to the inch, in the neighbourhood of Oil Center. In the Sacramento Valley, between Tehama and Sacramento, eight sheets were mapped on a scale of 2 inches to 1 mile, in Glen, Tehama, and Colusa counties. This work will furnish data upon which engineers will make a careful study of the drainage problems in the Tule flats of California.

In the neighbourhood of Kerwin, Wyoming, in Big Horn county, about 1,000 square miles were mapped on a scale of 2 miles to 1 inch, and about half that area was mapped on the same scale in the neighbourhood of Medicine Bow, in Albany and Carbon counties. In Arizona a line of precise levels was extended from Williams to

the Needles along the Lower Colorado River, and considerable topographic mapping is now in progress in various portions of Arizona, but is as yet uncompleted. Topographic parties will also be actively at work all winter in Texas and in southern California.

During the season considerable triangulation was extended in the High Sierras in the vicinity of Mt. Whitney, the highest peak in California. Boundary surveys, to mark the outlines of forest reserves, were completed in various portions of the West, considerable work being done about the Pocatello Forest Reserve, in Idaho, and upon the boundaries of Aquarius, Logan, and Payson Forest Reserves, in Utah. In the State of Montana a portion of the boundaries of the Lewis and Clark Forest Reserve was surveyed.

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## THE GEOGRAPHICAL RECORD.

### AMERICA.

INFLUENCE OF CANALS IN OHIO.—The story of the construction of the Ohio canals is well told by George W. Dial (*Ohio Arch. and Hist. Quart.*, Oct., 1904). He says that as the Erie and Champlain canals made New York the Empire State, and as the Pennsylvania canals made Pennsylvania the second State, in the Union, so the Ohio canals made it the third State in importance. In 1829 merchandise was carried from New York City to Dayton, Ohio, by an all-water route of 1,100 miles in twenty days at a cost of \$17.25 per ton. The route followed the Erie Canal to Buffalo, the lake to Cleveland, the Ohio Canal to Portsmouth, the Ohio River to Cincinnati, and the Miami Canal to Dayton. The canal counties immediately took the lead in industrial and agricultural growth—a lead they have never lost, as to-day only thirty out of the eighty-eight counties contain 52 per cent. of the State's population. To provide for a sufficient supply of water at all times, the State began the construction of immense reservoirs. The Mercer County reservoir, containing 18,000 acres, is said to be the largest artificial lake in the world. The canal system cost the State over \$14,000,000, and for a quarter of a century the canals were the most comfortable and convenient means of transportation and travel. Hundreds of sixty and eighty ton freight boats plied up and down between all points; while regular passenger packets, accommodating from forty to sixty travellers, connected with all stage and steamboat lines.